United States Patent [19]

Werner

[11] **Patent Number: 4,873,765**

[45] **Date of Patent: Oct. 17, 1989**

[54] **METHOD OF MAKING AN ELECTRICAL CONNECTOR**

[75] Inventor: **Walter M. Werner,** Downingtown, Pa.

[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

[21] Appl. No.: **238,020**

[22] Filed: **Aug. 29, 1988**

[51] **Int. Cl.**[4] **H01R 43/00**

[52] **U.S. Cl.** **29/876;** 29/882

[58] **Field of Search** 29/874–876, 29/882; 439/886, 887

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,290,665 9/1981 Krasnov et al. 439/887

4,626,126 12/1986 Suchdev et al. .

Primary Examiner—Timothy V. Eley

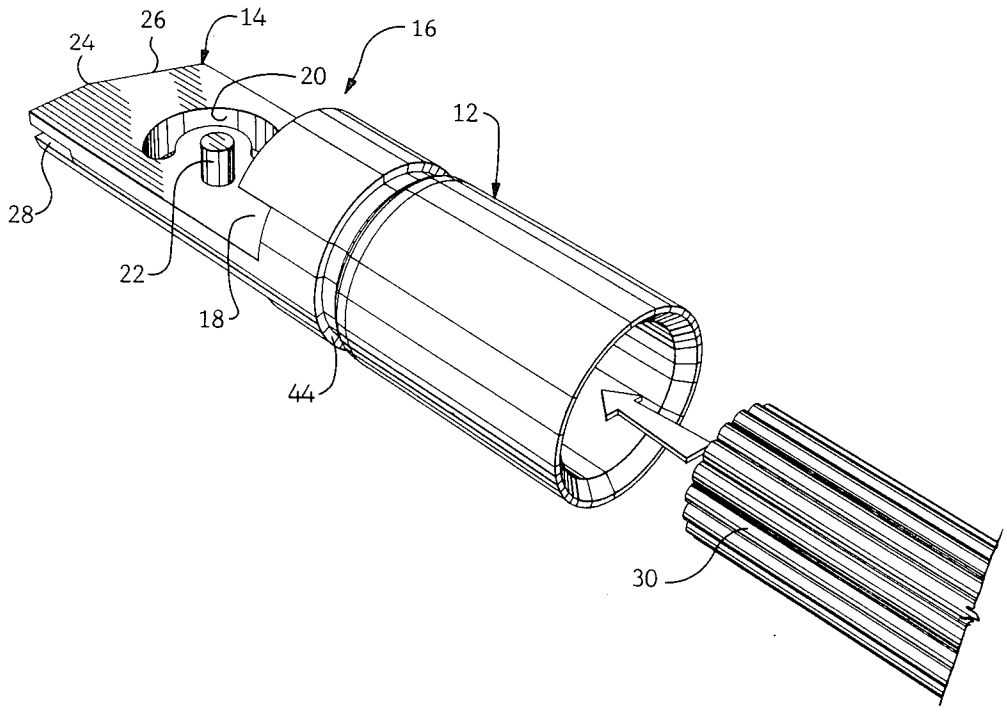
Assistant Examiner—Taylor J. Ross

Attorney, Agent, or Firm—Allan B. Osborne

[57] **ABSTRACT**

A method for making an electrical connector. More particularly, a slug of conductive material is impact-extruded into a form having a wire barrel at one end and at the other end, outwardly extending tang and flat blade. Simple machine operations including cutting, punching, coining, and inserting complete the form into an electrical connector.

3 Claims, 3 Drawing Sheets



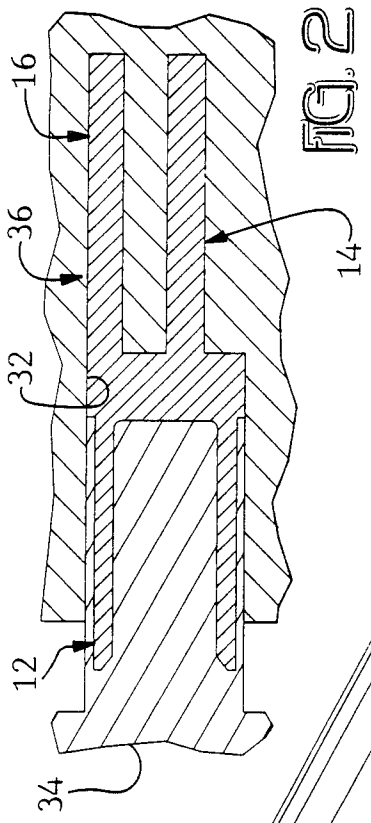


FIG. 2

FIG. 1

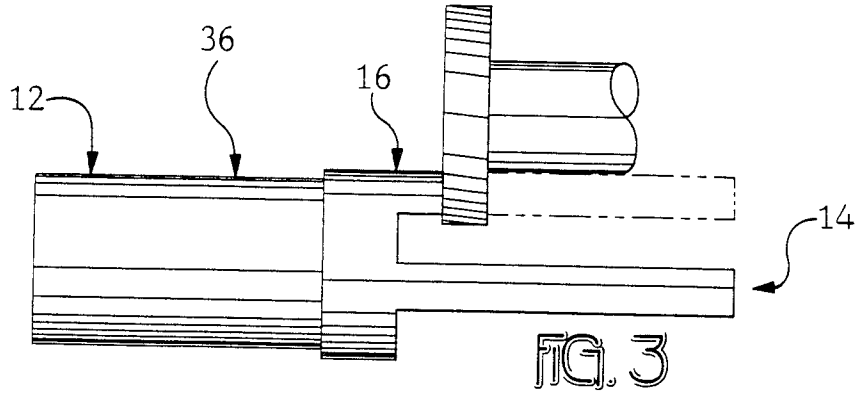


FIG. 3

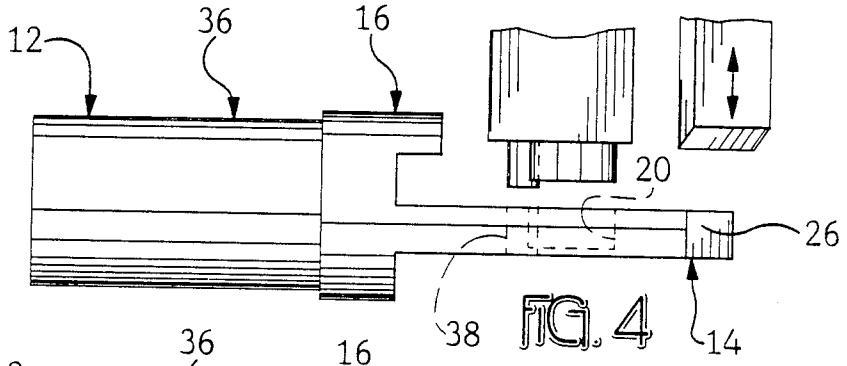


FIG. 4

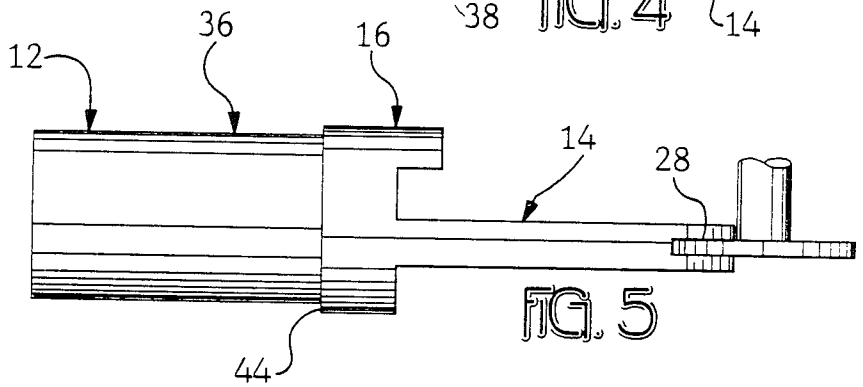


FIG. 5

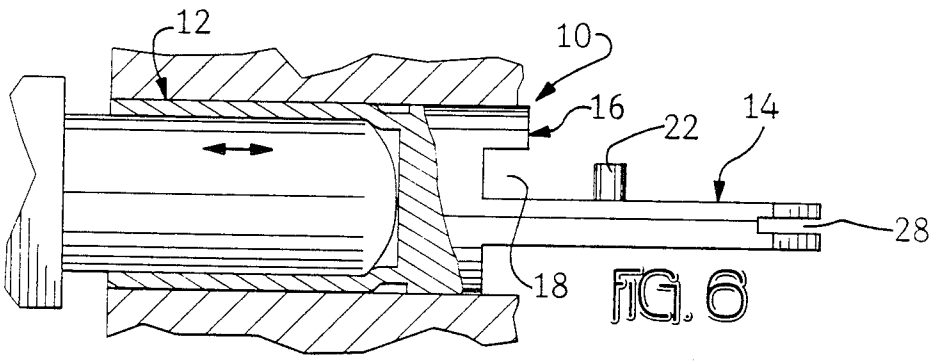


FIG. 6

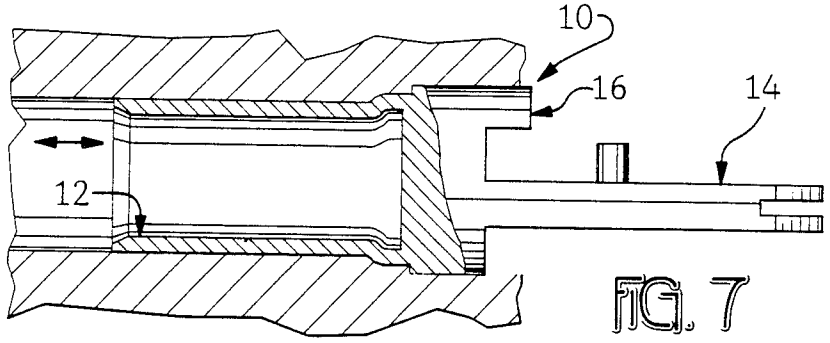


FIG. 7

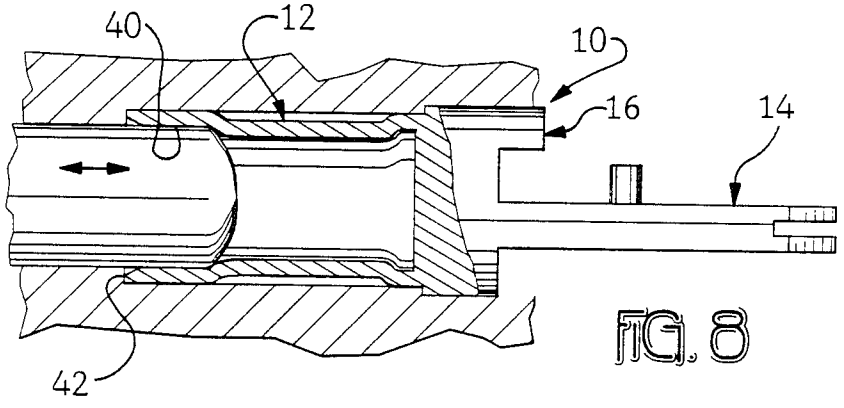


FIG. 8

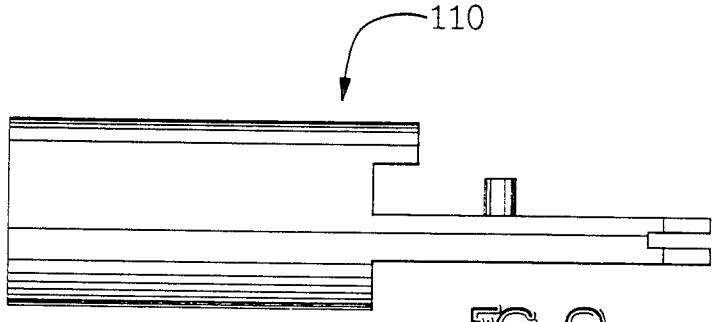


FIG. 9

METHOD OF MAKING AN ELECTRICAL CONNECTOR

FIELD OF THE INVENTION

This invention relates to a method of making an electrical connector by impact extrusion, forming and machining.

BACKGROUND OF THE INVENTION

It is known from U.S. Pat. No. 4,626,126 to make a connector by first extruding a socket from one end of a slug which had been work hardened. The socket is then annealed to soften the socket to adapt it for being crimped about an electrical cable. A tongue and jaw are then extruded from the opposite end of the slug with the extrusion causing a further and desirable work hardening to the tongue and jaw to provide wear resistance thereto. Finally, a recess and protrusion are extruded in and from the tongue to provide retaining means with another.

It is now proposed to provide an improved method of making an electrical connector.

SUMMARY OF THE INVENTION

According to the invention, a method of making an electrical connector includes the step of impact-extruding a slug of conductive material into a form having a cylindrical wire barrel at one end and an outwardly extending, parallel and spaced apart crescent shaped tang and flat blade at another end. The tang is shortened by cutting. A crescent or arcuate-shaped recess is then coined into the blade and after that, a hole is punched through the blade adjacent the recess. Further, one corner of the free end of the blade is sheared and the free end slotted with the slot being parallel to the plane of the blade. The connector is completed by inserting an upstanding pin into the punched hole in the blade.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a three dimensional view of an electrical connector made by the method of the present invention;

FIG. **2** is a sectional view showing the impact extrusion step in forming the connector;

FIG. **3** shows the step of shortening the tang at one end of the connector;

FIG. **4** shows the step of coining a recess and punching a hole in the blade;

FIG. **5** shows the step of machining a slot in the blade;

FIG. **6** shows an added step of expanding the wire barrel to provide one form of the connector;

FIG. **7** shows the step of reducing the wire barrel;

FIG. **8** shows the step of expanding the insulation barrel to produce another form of the connector; and

FIG. **9** shows an alternate form of the connector.

DESCRIPTION OF THE INVENTION

Electrical connector **10** shown in FIG. **1** is used as an illustration of the method of the prsent invention. Connector **10** includes a cylindrical wire barrel **12** at one end. As will be shown later on, barrel **12** can include an insulation support section **44** (FIG. **8**) at the free end thereof. The other end of connector **10**, generally referred to as the forward end, includes flat blade **14** and tang **16** which is parallel to and spaced from blade **14**. Tang **16** is much shorter than blade **14** and is crescent-shaped; i.e., the outer surface **16**-a is curved. Space **18** between blade **14** and tang **16** receives a blade **14** on a like connector **10** (not shown). An arcuate-shaped recess **20** and upstanding pin **22** are provided in blade **14** intermediate free end **24** of blade **14** and wire barrel **12**. One side of free end **24** is angled rather than squared off to provide an angled lead-in **26** for blade **14** as it enters space **18** on a like connector **10**. Further, free end **24** is provided with slot **28** to provide resiliency thereto.

As is well known in the art, cable **30** is inserted into wire barrel **12** and crimped or otherwise secured therein. Two like connectors **10** are engaged by respective pins **22** being placed in respective recesses **20** and the connectors rotated so that respective free ends **24** enter respective spaces **18**. The resilient deformation of free ends **24** in spaces **18** retain the connector **10** in a mated condition (not shown).

The method of making a connector **10** according to the method of the present invention includes the preliminary steps (not shown) of cutting a slug of conductive material; e.g. copper, weighting and then annealing it. The first step of the present invention, shown in FIG. **2** is placing the slug in cavity **32** and impacting it by ram **34**. The impact causes the slug to extrude into form **36** shown; i.e., a form having wire barrel **12** at one end and an elongated tang **16** and blade **14** at the other end.

In the next step, elongated tang **16** is shortened; e.g., by cutting as shown in FIG. **3**. This step opens the way to punch or drill hole **38** in blade **14** and coin out recess **20**. Additionally, a corner is sheared off blade **14** to provide lead-in **26**.

Slot **28** is cut into the face of free end **24** as shown in FIG. **5**.

After the completion of the step shown in FIG. **5**, pin **22** (FIG. **1**) may be placed in hole **38** to complete one form of connector **10** which is sized to receive a given cable size; e.g., 400 MCM.

If connector **10** is to be used with a larger size cable **30**; e.g., 500 MCM, barrel **12** may be expanded as shown in FIG. **6** and also FIG. **1**. If on the other hand connector **10** is to be used with a smaller size cable **30**; e.g., 250–350 MCM, barrel **12** is first reduced in diameter as shown in FIG. **7** and insulation support section **40** formed as shown in FIG. **8** by enlarging free end **42** of wire barrel **12**.

As shown in FIG. **1–8**, a rearwardly facing annular shoulder **44** is provided on connector **10** adjacent wire barrel **12**. FIG. **9** illustrates a connector **110** formed without such a shoulder.

As is readily apparent to those skilled in the art, the above described method is well suited to automation with minimal human intervention.

As can be discerned, a method of making an electrical connector has been disclosed. The basic step of impact extrusion produces a form which only requires straightforward forming and machining operations to complete the operation.

I claim:

1. A method for making an electrical connector comprising the steps of:

impact-extruding a slug of conductive material into a form having a cylindrical wire barrel at one end and at the other end an outwardly extending tang having a curved surface and an outwardly extending flat blade, said tang and blade overlying and spaced from each other;

shortening said tang so that only a short portion thereof overlies said blade;

coining an arcuate recess in said blade intermediate a free end thereof and said wire barrel and on a surface facing said tang;

punching a hole through said blade adjacent said recess;

shearing a corner off of said blade at the free end;

cutting a slot into said blade at the face of said free end, said slot being parallel to the plane of said blade; and

inserting an upstanding pin in said punched hole.

2. The method of making an electrical connector according to claim 1 further including the step of expanding the wire barrel.

3. The method according to claim 1 further including the steps of:

reducing the diameter of said wire barrel; and expanding a section of said wire barrel at a free end thereof to provide an insulation support section.

* * * * *